



Executive Summary

Current Events in California Water Management

This chapter highlights some significant infrastructure and institutional changes that have occurred since the publication of Bulletin 160-93, and reviews the status of selected high-profile programs.

Facilities

A common theme in previous *California Water Plan* updates has been the need to respond to the State's continually increasing population. Population growth brings with it the need for new or expanded infrastructure. California's water purveyors have made significant infrastructure improvements—including reservoirs, conveyance facilities, recycling and desalting facilities, and structural environmental restoration projects—since publication of the last *California Water Plan* update.

In 1998, Contra Costa Water District completed its 100 taf Los Vaqueros Reservoir, improving water quality and providing emergency storage for its service area. Metropolitan Water District of Southern California is constructing its Eastside Reservoir in Riverside County. When completed in 1999, this 800 taf reservoir will nearly double the region's

California's increasing population is a driving factor in future water management planning

existing surface storage capacity and will provide increased terminal storage for SWP and Colorado River supplies. Eastside Reservoir would provide the entire region with a six-month emergency supply after an earthquake or other disaster and would also provide water supply for drought protection and peak summer demands.

TABLE ES2-1
Major Water Conveyance Facilities Since 1992

<i>Facility</i>	<i>Constructing Agency</i>	<i>Status</i>	<i>Length (miles)</i>	<i>Maximum Capacity (cfs)</i>
Coastal Branch Aqueduct	Department of Water Resources	completed 1997	100	100
Eastside Reservoir Pipeline	Metropolitan Water District of Southern California	completed 1997	8	1,000
East Branch Enlargement	Department of Water Resources	completed 1996	100	2,880
Mojave River Pipeline	Mojave Water Agency	started 1997	71	94
Old River Pipelines (Los Vaqueros Project)	Contra Costa Water District	completed 1997	20	400
East Branch Extension	Department of Water Resources	started 1998	14	104
Inland Feeder Project	Metropolitan Water District of Southern California	started 1997	44	1,000
Morongo Basin Pipeline	Mojave Water Agency	completed 1994	71	100
New Melones Water Conveyance Project	Stockton East Water District and Central San Joaquin Water Conservation District	completed 1993	21	500

Several major conveyance projects were completed or began construction since the last water plan update. For example, the Department's Coastal Aqueduct, completed in 1997, now carries SWP water to San Luis Obispo and Santa Barbara Counties. Mojave Water Agency recently completed a major conveyance facility (71 miles long) and is constructing another of similar length to import surface water to its service area to alleviate longstanding groundwater overdraft problems. Large conveyance projects under construction or recently completed are listed in Table ES2-1.

Water recycling and desalting are becoming larger components of existing and potential future water supplies, especially for urban areas. Bulletin 160-98 estimates 1995-level total statewide water recycling to be 485 taf/yr, considerably higher than the Bulletin 160-93 total water recycling estimate of 384 taf/yr. Groundwater recharge and agricultural and landscape irrigation constitute the greatest uses of recycled water in the State. As advanced treatment technologies become more cost-effective, and as public acceptance increases, augmentation of surface water supplies may become another application for recycled water. The San Diego water repurification program, a proposed project to repurify 16 taf/yr of wastewater, would be the first example of highly treated recycled water being discharged directly into a surface reservoir.

Today, California has more than 150 desalting plants producing fresh water from brackish ground-

water, municipal and industrial wastewater, and seawater. The capacity of these plants totals about 66 taf/yr; seawater desalting capacity accounts for only 8 taf/yr of total capacity. Most existing plants are small (less than 1 taf/yr) and have been constructed in coastal communities with limited water supplies. The Santa



DWR's extension of the Coastal Branch to serve San Luis Obispo and Santa Barbara Counties provides an imported surface water supply that can help reduce overdraft of coastal groundwater basins.

Barbara desalting plant, with a capacity of 7.5 taf/yr, is the largest seawater desalting plant in California. The plant was constructed during the 1987-92 drought and is now on long-term standby. In 1997, the Marina Coast Water District completed construction on a reverse osmosis seawater desalting plant. This \$2.5 million plant produces about 340 af/yr.

Many large-scale environmental restoration projects and programs are being implemented. Facilities associated with these programs include the United States Bureau of Reclamation's Shasta Dam Temperature Control Device, USBR's Red Bluff Diversion Dam Research Pumping Plant, and many fish screens or fish passage improvements at local agency and privately-owned diversions. Financial assistance provided by programs such as CVPIA's anadromous fish restoration program and CALFED's Category III program has resulted in a major expansion of local agency screening and fish passage projects. Table ES2-2 lists some of the largest examples of recently completed structural fishery restoration projects.

Several more large fish screen facilities are nearing the final phases of design or construction, including diversions on the Sacramento River at the Glenn-Colusa Irrigation District, Reclamation District 108 near Grimes, Reclamation District 1004 near Princeton, the Princeton-Codora-Glenn Irrigation District and Provident Irrigation District consolidated diversion, and others. Construction of GCID's



USBR is evaluating the fishery impacts of different types of pump diversions to the Tehama-Colusa Canal. One alternative for improving fish passage at Red Bluff Diversion Dam would be to leave the dam's gates in the raised position and use a pumping plant to make TCC diversions. The research plant contains three pumps—one helical pump and two Archimedes screw pumps (right side of photo).

Hamilton City Pumping Plant screen began in spring 1998. This \$70 million project will minimize fish losses near the pumping plant and will maximize GCID's ability to meet its water supply delivery obligations. Reclamation District 108 began construction in 1997

TABLE ES2-2

Large Structural Fishery Restoration Projects

<i>Project</i>	<i>Owner</i>	<i>Description</i>
Shasta Dam Temperature Control Device	USBR	An approximately \$83 million modification to the dam's outlet works to allow temperature-selective releases of water through the dam's powerplant was completed in 1997.
Red Bluff Diversion Dam Research Pumping Plant	USBR	A \$40 million experimental facility to evaluate fishery impacts of different types of pumps diverting Sacramento River water into the Tehama-Colusa and Corning Canals was constructed in 1995.
Butte Creek fish passage	Western Canal Water District and others	A multi-component project to improve fish passage by removing small irrigation diversion dams from the creek. By 1998, five diversion dams will have been removed.
Maxwell Irrigation District fish screen	Maxwell ID	An 80 cfs diversion on the Sacramento River was screened in 1994.
Pelger Mutual Water Company fish screen	PMWC	A 60 cfs diversion on the Sacramento River was screened in 1994.

on a new \$10 million fish screen. The project, located at the district's Wilkens Slough diversion, will protect migrating winter-run chinook salmon. The district anticipates completing the project by the 1999 irrigation season. Reclamation District 1004 began construction of its \$8 million fish screen in 1998. In addition to a fish screen, the project includes relocation of the Princeton Pumping Plant and conveyance facilities. In 1998, the Princeton-Codora-Glenn and Provident Irrigation Districts are expected to complete construction of an \$11 million fish screen and pump consolidation project. The 600 cfs project eliminates three unscreened diversions.

Legislation

Proposition 204

In 1996, California voters approved Proposition 204, the Safe, Clean, Reliable Water Supply Act. The act authorized the issuance of \$995 million in general obligation bonds to finance water and environmental restoration programs throughout the State. Approximately \$600 million of these bonds would provide the State share of costs for projects benefitting the Bay-Delta and its watershed, including \$390 million of this amount to implement CALFED's ecosystem restoration program for the Bay-Delta. These latter funds would be available after final federal and State environmental documents are certified and a cost-sharing agreement is executed between the federal and State governments. Table ES2-3 summarizes all programs authorized for Proposition 204 funding.

Proposition 218

Voter approval of Proposition 218 in November 1996 changed the procedure used by local government agencies for increasing fees, charges, and benefit assessments. Benefit assessments, fees, and charges that are imposed as an "incident of property ownership" are now subject to a majority public vote. Proposition 218 defines "assessments" as any levy or charge on real property for a special benefit conferred to the real property, including special assessments, benefit assessments, and maintenance assessments. Proposition 218 further defines "fee" or "charge" as any levy (other than an ad valorem tax, special tax, or assessment), which is imposed by an agency upon a parcel or upon a person as an incident of property ownership, including a user fee or charge for a property-related service.

Although there are many tests to determine if a fee or charge is subject to the provisions of Proposition 218, the most significant one is whether the agency has relied upon any parcel map for the imposition of the fee or charge. There is currently uncertainty in the interpretation of Proposition 218 requirements, especially as they relate to certain water-related fees and charges. From one point of view, Proposition 218 could be interpreted as a comprehensive approach to regulate all forms of agency revenue sources. This broad interpretation would include all fees and charges for services provided to real property. Types of water-related charges and fees that may be affected by Proposition 218's requirements include meter charges, acreage-based irrigation charges, and standby charges. Additional legislation or judicial interpretation may be needed to clarify the application of Proposition 218 to fees and charges used by water agencies. Several water industry groups are working on proposals for clarifying legislation. To date, there has been one water-related legislative clarification of Proposition 218. A 1997 statute clarified that assessments imposed by water districts and earmarked for bond repayment are not subject to the proposition's voter approval requirements.

Municipalities and special districts are beginning to seek voter approval of assessments as required by Proposition 218. Many assessments to fund existing programs have been receiving voter approval. There is at least one example, however, of a water agency whose proposed assessment was not approved. Monterey County Water Resources Agency did not receive voter approval for an assessment to support existing programs—groundwater quality monitoring, water conservation, and nitrate management outreach—funded by water standby charges. Examples of MCWRA's proposed assessment charges were \$1.67 per irrigated acre for agricultural land use and \$2.26 per parcel for single-family dwellings.

MTBE

Detection of methyl tertiary butyl ether in water supplies soon after it was approved for use as an air pollution-reducing additive in gasoline has raised concerns about its mobility in the environment. Legislation enacted in 1997 included several provisions dealing with MTBE regulation, monitoring, and studies. One provision required the Department of Health Services to establish a primary (health-based) drinking water standard for MTBE by July 1999, and a secondary (taste and odor) drinking water standard by July 1998.

MTBE can be detected by taste at very low concentrations, hence the early requirement for a secondary drinking water standard.

Safe Drinking Water Act

The Safe Drinking Water Act, administered by the U.S. Environmental Protection Agency in coordination with the states, is the chief federal regulatory legislation dealing with drinking water quality. The 104th Congress reauthorized and made significant changes to the SDWA, which had last been reauthorized in 1986. Major changes included:

- Establishing a drinking water state revolving loan fund, to be administered by states in a manner similar to the existing Clean Water Act State Revolving Fund. Loans would be made available to public water systems to help them comply with national primary drinking water regulations and to upgrade water treatment systems.
- The standard-setting process for drinking water

contaminants established in the 1986 amendments was changed from a requirement that EPA adopt standards for a set number of contaminants on a fixed schedule to a process based on risk assessment and cost/benefit analysis. The 1996 amendments require EPA to publish (and periodically update) a list of contaminants not currently subject to national primary drinking water regulations, and to periodically determine whether to regulate at least five contaminants from that list, based on risk and benefit considerations.

- A requirement that states conduct vulnerability assessments in priority source water areas expanded existing source water quality protection provisions. States are authorized to establish voluntary, incentive-based source protection partnerships with local agencies. This activity may be funded from the new SRF.
- As a result of the 1996 amendments, EPA adopted a more ambitious schedule for promulgating the

TABLE ES2-3

Proposition 204 Funding Breakdown

<i>Program</i>	<i>Dollars (in millions)</i>
Delta Restoration	193
CVPIA State share	93
Category III State share	60
Delta levee rehabilitation	25
South Delta barriers	10
Delta recreation	2
CALFED administration	3
Clean Water and Water Recycling	235
State Revolving Fund Clean Water Act loans	80
Clean Water Act grants to small communities	30
Loans for water recycling projects	60
Loans for drainage treatment and management projects	30
Delta tributary watershed rehabilitation grants and loans	15
Seawater intrusion loans	10
Lake Tahoe water quality improvements	10
Water Supply Reliability	117
Feasibility investigations for specified programs	10
Water conservation and groundwater recharge loans	30
Small water project loans and grants, rural counties	25
Sacramento Valley water management and habitat improvement	25
River parkway program	27
CALFED Bay-Delta Ecosystem Restoration Program	390
Flood Control Subventions	60
Total	995

Disinfectant/Disinfection By-Products Rule and the Enhanced Surface Water Treatment Rule. The first phase of the D/DBP Rule is proposed to take effect in late 1998, as is an interim ESWTR. More stringent versions of both rules are proposed to follow in 2002.

Reclamation, Recycling and Water Conservation Act of 1996

This act amended Title 16 of PL 102-575 by authorizing federal cost-sharing in additional wastewater recycling projects. (PL 102-575 had authorized federal cost-sharing in specified recycling projects.) The additional California projects are shown below, along with the nonfederal sponsors identified in the statute.

- North San Diego County area water recycling project (San Elijo Joint Powers Authority, Leucadia County Water District, City of Carlsbad, Olivenhain Municipal Water District)
- Calleguas Municipal Water District recycling project (CMWD)
- Watsonville area water recycling project (City of Watsonville)
- Pasadena reclaimed water project (City of Pasadena)
- Phase 1 of the Orange County regional water reclamation project (Orange County Water District and County Sanitation Districts of Orange County)
- Hi-Desert Water District wastewater collection and reuse facility (HDWD)
- Mission Basin brackish groundwater desalting demonstration project (City of Oceanside)
- Effluent treatment for the Sanitation Districts of Los Angeles County with the City of Long Beach (Water Replenishment District of Southern California, OCWD)
- San Joaquin area water recycling and reuse project (San Joaquin County, City of Tracy)

Federal cost-sharing in these projects is authorized at a maximum of 25 percent for project construction and federal contributions for each project are capped at \$20 million. Funds are not to be appropriated for project construction until after a feasibility study and cost-sharing agreement are completed. Federal cost-sharing may not be used for operations and maintenance.

The act also authorizes the Department of Interior to cost-share up to 50 percent (planning and design) in a Long Beach desalination research and

development project. Local sponsors are the City of Long Beach, Central Basin Municipal Water District, and MWDSC.

Water Desalination Act of 1996

This act authorizes DOI to cost-share in non-federal desalting projects at levels of 25 percent or 50 percent (for projects which are not otherwise feasible unless a federal contribution is provided). Cost-shared actions can be research, studies, demonstration projects, or development projects. The authorization provides \$5 million per year for fiscal years 1997 through 2002 for research and studies, and \$25 million per year for demonstration and development projects. The act requires DOI to investigate at least three different types of desalting technology and to report research findings to Congress.

Major Water Management Issues and Programs

Bay-Delta Accord and CALFED

Representatives from the California Water Policy Council, created to coordinate activities related to State long-term water policy, and the Federal Ecosystem Directorate, created to coordinate actions of federal agencies involved in Delta programs, signed a Framework Agreement for the Bay-Delta estuary in June 1994. Together, these agencies are known as CALFED. The Framework Agreement improved coordination and communication between State and federal agencies with resource management responsibilities in the estuary. It covered the water quality standards setting process; coordinated water project operations with requirements of water quality standards, endangered species laws, and CVPIA; and provided for cooperation in planning long-term solutions to problems affecting the estuary's major public values.

In December 1994 State and federal agencies, working with stakeholders, reached agreement on the "Principles for Agreement on Bay-Delta Standards Between the State of California and the Federal Government" (referred to as the Bay-Delta Accord) that would remain in effect for three years. Provisions of the Bay-Delta Accord covered water quality standard setting and water project operational constraints, ESA implementation and use of real-time monitoring data, and improvement of conditions not directly related to Delta outflow. Parties to the Accord committed to fund

“non-flow Category III” measures at \$60 million per year for the agreement’s three-year term. The Accord was subsequently extended for a fourth year. An Operations Group composed of representatives from the State and federal water projects and the other CALFED agencies was established to coordinate project operations. Stakeholders from water agencies, and environmental and fishery groups participate in Operations Group meetings.

Water Quality Standard Setting. SWRCB adopted a water quality control plan for the Bay-Delta in May 1995, incorporating agreements reached in the Accord. In June 1995, SWRCB adopted Order WR 95-6, an interim order amending terms and conditions of SWRCB’s Decision 1485 and the SWP’s and Central Valley Project’s water right permits to resolve inconsistencies with D-1485 requirements and the projects’ voluntary implementation of Accord standards. The interim order will expire when a water right decision allocating final responsibilities for meeting the 1995 objectives is adopted, or on December 31, 1998, whichever comes first. SWRCB released a revised draft EIR for implementing the water quality control plan in 1998, and intends to issue a water right decision implementing the order by the end of 1998. The DEIR has eight flow alternatives:

- (1) SWP and CVP Responsible for D-1485 Flow Objectives
- (2) SWP and CVP Responsible for 1995 Bay-Delta Water Quality Control Plan Flow Objectives
- (3) Water Right Priority Alternative—the CVP’s Friant Unit is assumed to be an in-basin project.
- (4) Water Right Priority Alternative—the CVP’s Friant Unit is assumed to be an export project.
- (5) Watershed Alternative—monthly average flow requirements are established for major watersheds based on Delta outflow and Vernalis flow objectives and the watersheds’ average unimpaired flow. The parties responsible for providing the required flows are water users with storage in foothill reservoirs that control downstream flow to the Delta, and water users with upstream reservoirs that have a cumulative capacity of at least 100 taf who use water primarily for consumptive uses.
- (6) Recirculation Alternative—USBR is required to make releases from the Delta-Mendota Canal to meet the Vernalis flow objectives.
- (7) San Joaquin Basin Negotiated Agreement—San Joaquin Basin water right holders’ responsibility to meet the plan objectives is based on an

agreement titled “Letter of Intent among Export Interests and San Joaquin River Interests to Resolve San Joaquin River Issues Related to Protection of Bay-Delta Environmental Resources.”

- (8) San Joaquin Basin Negotiated Agreement—Vernalis flow objectives are replaced by target flows contained in the agreement.

CALFED Long-Term Solution-Finding Process for Bay-Delta. The June 1994 Framework Agreement called for a State-federal process to develop long-term solutions to Bay-Delta problems related to fish and wildlife, water supply reliability, natural disasters, and water quality. The CALFED program is managed by an interagency team under the policy direction of CALFED member agencies, with public input provided by the Bay-Delta Advisory Council. BDAC is a 31-member advisory panel representing California’s agricultural, environmental, urban, business, fishing, and other interests who have a stake in the long-term solution to Bay-Delta problems.

The CALFED program’s first phase identified problems and goals for the Bay-Delta, and developed a range of alternatives for long-term solutions. This phase concluded with a September 1996 report identifying three broad solutions, each of which included



Actions funded by the Category III program include fish screening, fish passage improvements, habitat acquisition, and control of non-native invasive species. The zebra mussel has caused millions of dollars of increased operations and maintenance costs to Great Lakes water users. Preventing the mussels’ spread is a priority in invasive species management.



CALFED's Ecosystem Restoration Program calls for extensive creation of new habitat in the Delta. Construction of setback levees would allow restoration of riparian and riverine aquatic habitats, benefitting fish and wildlife.

a range of water storage options, a system for conveying water, and some programs that were common to all alternatives. The second phase consisted of preparing a programmatic EIR/EIS covering three main alternatives for conveyance of water across the Delta—an existing system alternative, a through-Delta alternative, and a dual Delta conveyance alternative. The first public review draft of the PEIR/PEIS was released in March 1998. CALFED expects to issue a second draft PEIR/PEIS by the end of 1998. The revised draft would identify CALFED's draft preferred alternative.

The third phase would involve staged implementation of the preferred alternative over a time period of several decades and will require site-specific environmental documents. Current plans are for an initial implementation period of 7 to 10 years, during which only common program elements would be implemented (water conservation measures, ecosystem restoration, levee improvements). Any conveyance or storage facilities would be constructed in a later phase of implementation.

ESA Administration. The December 1994 Bay-Delta Accord established several principles governing ESA administration in the Bay-Delta during the agreement's term.

- The Accord is intended to improve habitat conditions in the Bay-Delta to avoid the need for additional species listings during the agreement's term. If additional listings do become necessary, the federal government will acquire any additional water supply needed for those species by buying water from willing sellers.
- There is intended to be no additional water cost to the CVP and SWP resulting from compliance with biological opinion incidental take provisions for presently listed species. The CALFED Operations Group is to develop operational flexibility by adjusting export limits.
- Real-time monitoring is to be used to the extent possible to make decisions regarding operational flexibility. CALFED commits to devote significant resources to implement real-time monitoring.

Colorado River

A major issue facing California is its use of Colorado River water in excess of the amount apportioned to it by the existing body of statutes, court decisions, and agreements controlling use of the water supply among the seven basin states. California's basic apportionment of river water is 4.4 maf of consumptive use per year (plus a share of surplus flows, when available), as compared to its present consumptive use of up to 5.3 maf/yr. California's use has historically exceeded the basic apportionment because California has been able to divert and use Arizona's and Nevada's unused apportionments, and to divert surplus water. With completion of the Central Arizona Project and the 1996 enactment of groundwater banking legislation, Arizona projects that it will use almost all of its 2.8 maf apportionment for the first time in 1998. Nevada is projected to use about 280 taf of its 300 taf apportionment in 1998.

California local agencies, working through the Colorado River Board of California, have been developing a proposal for discussion with the other basin states to illustrate how, over time, California would reduce its use to the basic apportionment of 4.4 maf/yr. Drafts of the proposal, known as the draft Colorado River Board 4.4 Plan, have been shared with the other states. Efforts are being made to reach intra-state consensus on the plan in 1998. As Bulletin 160-98

goes to press, the most current version of the draft plan is the December 1997 version.

As formulated, the draft plan would be implemented in two phases. The first phase (between the present and 2010 or 2015) would entail implementing already identified measures such as water conservation and transfers to reduce California's Colorado River water use to about 4.6 to 4.7 maf/yr. The second phase would implement additional measures to reduce California's use to its basic annual 4.4 maf apportionment in those years when neither surplus water nor other states' unused apportionments were available. One of the fundamental assumptions made in the plan is that MWDSC's Colorado River Aqueduct will be kept full by making water transfers from agricultural users in the Colorado River Region to urban water users in the South Coast Region.

Actions included in the first phase were: core water transfers such as the existing Imperial Irrigation District/MWDSC agreement and the proposed Imperial Irrigation District/San Diego County Water Authority transfer; seepage recovery from unlined sections of the All American and Coachella Canals; drought year water transfers similar to the Palo Verde Irrigation District/MWDSC pilot project; groundwater banking in Arizona; and conjunctive use of groundwater in areas such as the Coachella Valley. The draft plan recognizes that transfers of conserved water must be evaluated in the context of preserving the Salton Sea's environmental resources, and also that plan elements must address environmental impacts on the lower Colorado River and its listed species.

Other actions to occur as part of the first phase would include implementation of the San Luis Rey Indian water rights settlement authorized in PL 100-675 and implementation of measures to administer agricultural water entitlements within the first three priorities of the Seven Party Agreement. An important element of the draft CRB 4.4 Plan is the concept that existing reservoir operating criteria be changed by USBR to make optimum use of the river's runoff and available basin storage capacity. California agencies developed new proposed operating criteria that are included in the draft CRB 4.4 Plan. The draft plan contemplates that changes in operating criteria would be part of both the first and second phases. The other basin states have been cautious in their reaction to California's proposals for reservoir reoperation, and have suggested, for example, that new criteria should not be implemented until California has prepared the

environmental documents and executed the agreements that would be needed to begin implementation of the draft CRB 4.4 Plan.

The second phase of the draft CRB 4.4 Plan would include additional average year and drought year water transfers. Specifics on these transfers would be developed during the first phase of plan implementation. Other components of the second phase would include further transfers of conserved agricultural water to the South Coast and further work on reservoir operating criteria. Implementation of some elements of phase two of the plan may extend beyond the Bulletin 160-98 planning horizon.

Recent ESA Listings

Since publication of Bulletin 160-93, there has been action on federal listing of several fish species having statewide water management significance. In August 1997, the National Marine Fisheries Service listed two coastal steelhead populations as threatened (from the Russian River south to Soquel Creek, and from the Pajaro River south to the Santa Maria River), and one population as endangered (from the Santa Maria River south to Malibu Creek). NMFS deferred listing decisions for six months for other California populations—from the Elk River in Oregon to the Trinity River in California, from Redwood Creek to



USBR's Parker Dam on the Colorado River impounds Lake Havasu. At this location, the Colorado River forms the stateline between California and Arizona. MWDSC's Colorado River Aqueduct and the Central Arizona Project divert from Lake Havasu.

the Gualala River, and in the Central Valley—due to scientific disagreement about the sufficiency and accuracy of the data available for listing determinations. In March 1998, NMFS listed the Central Valley population as threatened, and deferred listing of the two north coast populations in favor of working with California and Oregon on state conservation plans.

Also in 1997, NMFS listed the Southern Oregon/Northern California coast evolutionarily-significant unit of coho salmon as threatened. In 1996, NMFS listed coho salmon in the central coast ESU (from Punta Gorda in Humboldt County south to the San Lorenzo River) as threatened.

In 1998, NMFS proposed several runs of chinook salmon for listing—the spring-run in the Central Valley ESU as endangered, the fall and late-fall runs in the Central Valley ESU as threatened, and the spring and fall runs in the Oregon/California coastal ESU as threatened. (The spring-run chinook salmon has been listed as a candidate species under the California ESA.) NMFS expects to make its decision on listing in 1999.

USFWS proposed in 1994 to list a resident Delta fish species, the Sacramento River splittail, but a congressional moratorium on listing of new species prevented USFWS from working on the proposal until 1996. USFWS again proposed to list splittail in 1996, but received significant public comments on new scientific information for splittail. The extended public comment period ended July 1998. USFWS is expected to make a decision after reviewing comments.

USFWS has also listed or proposed for listing species whose limited range would result in localized water management impacts. For example, the red legged frog, found primarily in the Central Coast area, was listed as threatened in 1996. Another example is the Santa Ana sucker, found in the Santa Ana River, proposed for listing in 1998.

January 1997 Central Valley Floods

The January 1997 flood event was notable for its sustained rainfall intensity, the volume of floodwater, and the extent of the storm pattern—from the Oregon border down to the southern end of the Sierra. Over a three day period, warm moist winds from the southwest blew over the Sierra Nevada, pouring over 30 inches of rain on watersheds already saturated by one of the wettest Decembers on record. In many major river systems, flood control dams reduced flood flows by half or more, saving lives and significantly reducing property damage. However, in some areas, leveed

flood control systems were overwhelmed, causing approximately \$2 billion in damages.

Most of the large reservoirs in Northern California were full or nearly full within the first days in January. Several Sacramento Valley reservoirs—including Shasta, Oroville, and New Bullards Bar—experienced record inflows during the January 1997 flood event. American River inflow to Folsom Reservoir was similar to the amount recorded during the February 1986 flood. Levees of the federal Sacramento River Flood Control Project (see sidebar) sustained moderate to heavy damage, including two major levee breaks (one near the town of Arboga) and several relief cuts. Flooding in the Marysville-Yuba City area resulted in 35,000 people being evacuated from the Marysville area and 75,000 people being evacuated downstream in Sutter County.

The volume of runoff exceeded the flood control capability of New Don Pedro Reservoir on the Tuolumne River and Millerton Lake on the Upper San Joaquin River. While the peak flood release from New Don Pedro Dam was less than half the peak Tuolumne River inflow of 120,000 cfs, it was more than six times the downstream channel's flow restrictions of 9,000 cfs. In all, 36 levee failures occurred along the San Joaquin River system, along with extensive damage related to high flows and inundation. Most of the damage occurred downstream of the Tuolumne River confluence.

The January 1997 floods demonstrated the need for increased Central Valley flood protection. The 1997 *Final Report of the Governor's Flood Emergency Action Team* identified many actions that could be taken to increase valley flood protection, including better emergency preparedness, floodplain management actions, levee system improvements, construction of new floodways, temporary storage of floodwaters on wildlife refuges, reoperation or enlargement of existing reservoirs to increase flood storage, and construction of new reservoirs.

The Sacramento River Flood Control Project's ability to provide protection for growing urban areas is the primary flood control issue facing the Sacramento Valley. Additional flood protection is needed in the Yuba River Basin, particularly in the greater Marysville-Yuba City area. Additional flood protection is also needed in the American River Basin for the Sacramento metropolitan area, as discussed in the accompanying sidebar. The 1997 FEAT report detailed several recommendations and possible actions for the Sacramento

The Sacramento metropolitan area has one of the lowest flood protection levels in the nation, for a community of its size. Without interim reoperation of Folsom Dam, the community is estimated to have only a 1-in-60 year level of protection. (With reoperation, the level of protection is 1-in-77 years).

This photo shows the American River in January 1997, and the high-density urban development adjacent to the levee.



Valley, including new flood storage, enlarged flood bypasses, and increasing channel capacity through measures such as dredging and setback levees.

The primary flood control issue facing the San Joaquin River watershed is the lack of flood channel capacity. Channels and levees are generally designed for 50-year flood protection. Insufficient channel capacity is especially problematic in the lower San Joaquin

River below the Merced River. At the lower end of the system, sediment deposition continues to raise the river bed and reduce channel capacity. Sediment deposition also promotes vegetation growth, thereby increasing channel roughness and further impeding flows. As urban development occurs on lands formerly used for agriculture, the need for higher levels of flood protection becomes more important. The 1997 FEAT report

American River Flood Protection

Following the floods of February 1986, the United States Army Corps of Engineers reanalyzed American River Basin hydrology and concluded that Folsom Dam did not provide an adequate level of flood protection to the downstream Sacramento area, significantly less than the 250-year protection estimated in the late 1940s when the dam was designed. The 977 taf reservoir has a normal winter flood control reservation of 400 taf (estimated to provide the Sacramento area with protection from a storm having a 1-in-60-year return period).

Three main flood protection alternatives have been evaluated by USACE. Two of the alternatives would increase flood control storage in Folsom, modify the dam's spillway and outlet works, and improve downstream levees. The third alternative would construct a detention dam at Auburn, with downstream levee improvements. USACE studies identified the detention dam as the plan that maximized national economic benefits. The State Reclamation Board endorsed the detention dam as the best long-term solution to reliably provide greater than 1-in-200 year flood protection.

The Central Valley's January 1997 flood disaster prompted another examination of American River hydrology. Based on

that hydrologic review, the 1986 and 1997 floods are now considered to be about 60-year events. The 1997 flooding also triggered payback provisions of the Sacramento Area Flood Control Agency's agreement with USBR, under which USBR sets aside up to 270 taf of additional winter flood control space in Folsom. (This additional flood control space in the reservoir raises Sacramento's level of protection to about a 77-year event level.) Reoperation of Folsom for additional flood control resulted in a loss of supply to USBR. SAFCA and the federal government purchased 100 taf to offset the loss of supply—50 taf from Yuba County Water Agency, 35 taf from Placer County Water Agency, and 15 taf from GCID.

In 1998, the Reclamation Board restated its conclusion that the best long-term engineering solution to reliably provide greater than 1-in-200 year flood protection is to develop additional flood detention storage at Auburn. As an incremental measure to increase the level of flood protection, the Board also resolved to support SAFCA's plan for modifying Folsom Dam's outlets to increase flood protection to approximately a 1-in-110 year level. As of June 1998, SAFCA was seeking congressional authorization for USACE participation in Folsom Dam modifications and downstream levee enlargements.

The January 1997 flood disaster was the largest in the State's history. Flooding forced more than 120,000 people from their homes, and over 55,000 people were housed in temporary shelters. Nearly 300 square miles of agricultural land were flooded. Livestock and wildlife were trapped by the flooding



detailed several recommendations and possible actions for the San Joaquin River watershed, including new flood storage, development restrictions and land acquisitions in the floodplain, and increasing channel capacity through measures such as dredging, setback levees, and improving bridge crossings.

CVPIA Implementation

CVPIA made significant changes to the CVP's legislative authorization, amending the project's purposes to place fish and wildlife mitigation and restoration on a par with water supply, and to place fish and wildlife enhancement on a par with power generation. Key areas of CVPIA implementation are summarized below. USBR and U.S. Fish and Wildlife Service released a draft programmatic EIS on CVPIA implementation for public review in November 1997. The draft PEIS describes, among other things, esti-

mated water supply impacts of federal implementation of the act, and illustrates the consequences of different alternatives for fish and wildlife supplemental water acquisition. A final EIS is scheduled to be released in 1999.

Renewal of CVP Water Service Contracts. CVPIA prohibited execution of new CVP water service contracts (with minor exceptions), except for fish and wildlife purposes, until all of the many environmental restoration actions specified in the statute had been completed. The act also provided that existing long-term water service contracts be renewed for 25-year terms, as opposed to their previous 40-year terms. Only interim renewals (not more than three years) are allowed until the PEIS required by the act is completed. Beginning in October 1997, most existing long term contracts are subject to a monetary hammer clause encouraging early renewal. Renewed contracts will in-

Sacramento River Flood Control Project

Congress authorized the Sacramento River Flood Control Project in 1917 after a series of major Sacramento Valley floods in the late 1800s and early 1900s. The project was built with local, State, and federal funding. The project includes levees, overflow weirs, bypass channels, and channel enlargements. Overflow weirs allow excess water in the main river channel to flow into bypasses in the Sutter Basin and Yolo Basin. The bypass system was designed to carry 600,000 cfs of water past Sacramento—110,000 cfs in the Sacramento River through downtown Sacramento and West Sacramento, and the remainder in the Yolo Bypass. The system has worked exceedingly well over the years.

The capacity of the SRFCP was increased upon completion of Shasta Dam in 1945 and Folsom Dam in 1956. The Feather and Yuba River systems did not share in the SRFCP's flood control benefits; however, supplemental protection was provided by the completion of Oroville Dam on the Feather River in 1968 and New Bullards Bar Dam on the Yuba River in 1970. These are large multipurpose reservoirs in which flood control functions share space with water supply functions.

corporate new provisions required by CVPIA, such as tiered water pricing. Since USBR has not completed the PEIS, all contract renewals to date have been interim renewals. USBR has had more than 60 interim contract renewals from the date of enactment through 1996, representing over 1 maf/yr of supply.

Fish and Wildlife Restoration Actions. One of the most controversial elements of CVPIA implementation has been management of the 800 taf of CVP yield (see sidebar) dedicated by the act to fishery restoration purposes. This water is available for use on CVP controlled streams (river reaches downstream from the project's major storage facilities on the Sacramento River, American River, and Stanislaus River) and in the Bay-Delta.

The ambiguity of the statutory language and the use of dedicated water in the Bay-Delta Accord have generated many questions, including whether the water may be exported from the Delta after the water has been used for instream flow needs in upstream rivers, and if the water may be used for Bay-Delta purposes beyond Accord requirements. Initially, USBR and USFWS attempted to develop guidelines or criteria for its management. Subsequent to CALFED's creation, the CALFED Operations Group became a forum for attempting to resolve dedicated water. In November 1997, DOI released its final administrative proposal on management of the dedicated water. The proposal's release was subsequently challenged in legal action filed by some CVP water contractors.

A main purpose of the dedicated water is meeting the act's goal of doubling natural production of Central Valley anadromous fish populations (from their average 1967-91 levels) by year 2002. Release of water to the San Joaquin River from Friant Dam is excluded from this program. CVPIA authorizes USBR and USFWS to acquire additional, supplemental water from willing sellers to help achieve the doubling goal.

CVPIA further allocates additional CVP water supply for instream use in the Trinity River by reducing the quantity of water which the project could otherwise divert, requiring that an instream flow of 340 taf/yr be maintained through water year 1996 while USFWS finishes a long-term instream flow study. (USFWS now recommends instream flows much greater than 340 taf/yr.)

CVPIA enumerates specific physical restoration measures that the federal government must complete for fishery and waterfowl habitat restoration. The largest completed measures are a temperature control device at Shasta Dam, at a cost of over \$83 million, and a research pumping plant at Red Bluff Diversion Dam. CVPIA allocated part of the costs of some restoration measures to the State; the remaining costs are being paid by federal taxpayers and by CVP water and power contractors. Some of the smaller restoration actions include individual fish-screening projects that USBR and USFWS are cost-sharing with local agencies under the anadromous fish screening program.

CVPIA required USBR to impose a surcharge on CVP water and power contracts for deposit into a Restoration Fund created by the act. Monies deposited into the fund are appropriated by Congress to help fund CVPIA environmental restoration actions. The act authorizes appropriation of up to \$50 million (1992 dollars) per year for the restoration actions. Annual deposits into the fund vary with water and power sales. CVPIA environmental restoration actions can be funded from the general federal treasury, as well as from the Restoration Fund.

Land Retirement Program. CVPIA authorized DOI to carry out an agricultural land retirement program for lands receiving CVP water. USBR published interim guidelines for administration of a pilot program, pending formal promulgation of rules and regulations. The federal guidelines were developed in

CVPIA's Dedicated Water

Section 3406(b)(2) describes the dedicated water as follows:

Upon enactment of this title dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay-San Joaquin Delta Estuary; and to help meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title,

including but not limited to additional obligations under the federal Endangered Species Act. For the purpose of this section, the term "Central Valley Project yield" means the delivery capability of the Central Valley Project during the 1928-1934 drought period after fishery, water quality, and other flow and operational requirements imposed by terms and conditions existing in licenses, permits, and other agreements pertaining to the Central Valley Project under applicable State or Federal law existing at the time of enactment of this title have been met.

coordination with a State land retirement program established in 1992 under Water Code Section 14902 *et seq.* The State statute limited the retirement program to drainage-impaired lands. The State land retirement program has never been funded, and thus no State acquisitions have been made. By November 1997, the federal land retirement program had made one purchase—about 600 acres of drainage-impaired land in Westlands Water District that would be managed for wildlife habitat. Recently, USBR solicited proposals from landowners wishing to participate in the retirement program and received offers to sell lands amounting to 31,000 acres.

Other Programs and Reports. From a water supply standpoint, certain CVPIA-mandated reports are of special interest. USFWS has prepared several draft documents relating to estimated Central Valley environmental water needs and water management actions for the AFRP. The most recent draft of the AFRP was published in May 1997. In 1995, USBR released an appraisal-level least-cost CVP yield increase plan, required by the act to identify options for replacing the water supply dedicated to environmental purposes. Although the act directed that the plan be prepared, USBR was not required to implement it.

SWP Monterey Agreement Contract Amendments

The Monterey Agreement among the Department and SWP water contractors was signed in December 1994. This agreement set forth principles for making changes in SWP water supply contracts, which would then be implemented by an amendment (Monterey Amendment) to each contractor's SWP contract. The amendment has been offered to all SWP contractors. Those contractors that sign the amendment will receive the benefits of it, while those that do not will have their water supply contracts administered such that they will be unaffected by the amendment. As of July 1998, 26 of the 29 contractors had signed the amendment.

Changes to SWP Water Allocation Rules. The amendment states that during drought years project supplies are to be allocated proportionately on the basis of contractors' entitlements. The amendment allocates water to urban and agricultural purposes on an equal basis, deleting a previous initial supply reduction to agricultural contractors.

Permanent Sales of Entitlement. The amendment provides for transfer of up to 175 taf of entitlement from agricultural use. The first transfer

made was relinquishment of 45 taf of entitlement (40,670 af from Kern County Water Agency, 4,330 af from Dudley Ridge Water District) back to the SWP, as part of the transfer of the Kern Water Bank property to these agencies. This relinquishment reduces the total SWP contractual commitment. The amendment provides for an additional 130 taf of existing agricultural entitlement to be sold on a permanent basis to urban contractors, on a willing buyer-willing seller basis.

Storing Water Outside a Contractor's Service Area; Transfers of Non-Project Water. This provision allows a contractor to store water in another agency's reservoir or groundwater basin. Examples include water storage programs with Semitropic Water Storage District, a member agency of Kern County Water Agency. The amendment also provides a mechanism for using SWP facilities to transport non-project water for SWP water contractors. (The Department uses other contractual arrangements for wheeling water for the CVP and for other non-SWP water users.)

Annual Turnback Pool. Prior to the amendment, water allocated to contractors that was not used during a year would revert to the SWP at the end of the year. No compensation was provided to the contractor for this water, and no other contractors could make use of these supplies during the year. The turnback pool is an internal SWP mechanism which provides for pooling potentially unused supplies early in the year for purchase by other SWP contractors at a set price. If neither the SWP nor individual SWP contractors wish to use water placed into the pool, that water may then be sold to entities that are not SWP contractors.

Other Operational Changes. The amendment established a procedure to transfer ownership of the Department's KWB property to KCWA and Dudley Ridge Water District. The amendment allows contractors repaying costs of constructing the Castaic and Perris terminal reservoirs to increase their control and management of a portion of the storage capacity of each reservoir, to optimize the operation of local and SWP facilities. This is expected, for example, to improve dry year supplies for MWDSC, Castaic Lake Water Agency, and Ventura County Flood Control and Water Conservation District.

Environmental Restoration Activities

Several major environmental restoration activities are ongoing throughout the State, in addition to the

intensive effort focused on the Bay-Delta. Projects focused on fishery and habitat restoration on the State's three most important river systems—the Sacramento, San Joaquin, and Colorado Rivers—are described below, followed by a brief mention of restoration and mitigation projects in other watersheds.

Sacramento River System. The extensive structural environmental restoration actions being performed in the Sacramento River system were described earlier in this chapter. These actions include major projects such as USBR's Shasta Dam Temperature Control Device and research pumping plant at Red Bluff Diversion Dam, as well as fish screen installations at many of the larger irrigation diversions on the Sacramento River mainstem. Many more restoration actions are being planned, such as additional fish passage improvements on Butte and Clear Creeks and at Anderson-Cottonwood Irrigation District's diversion dam. Many of the actions on the river's mainstem were in response to the need to protect listed winter-run chinook salmon. Actions are also being taken to protect spring-run chinook salmon, a species proposed for listing under the federal ESA and a State candidate species.

In 1995, State legislation restricted future water development on Mill and Deer Creeks to protect spring run chinook salmon habitat. In addition, local landowners formed the Mill and Deer Creek Watershed Conservancies. The conservancies have begun a watershed planning and management process, with funding assistance from an EPA grant. The Department has participated with Mill Creek landowners in

a test project to construct wells to provide groundwater supplies in lieu of creek diversions for irrigation during spring fish migration periods. A similar project is being negotiated with Deer Creek water users.

San Joaquin River System. One of the first overviews of San Joaquin River restoration needs was provided by the Resources Agency's 1995 San Joaquin River Management Program Plan, which evaluated potential actions on part of the river's mainstem and on the lower reaches of its main tributaries. Structural restoration work performed to date has focused largely on spawning gravel placement and related habitat improvements. Several other projects are now in planning, including replacement of Central California Irrigation District's Mendota Dam and a potential new fish hatchery on the Tuolumne River. Increased instream flows have been provided in the river system through SWRCB Order WR 95-6 requirements and through a FERC settlement agreement for the Tuolumne River.

The San Joaquin River Conservancy, a State agency charged with acquiring and managing public lands within the San Joaquin River Parkway, is working to expand lands preserved by the parkway. The parkway includes the San Joaquin River and about 5,900 acres of land on both sides of the river, extending about 22 miles from Friant Dam downstream to the Highway 99 crossing of the river. The parkway is planned as a riparian corridor with public access trails, boating access points, wildlife areas, and education areas. Approximately 1,900 acres are located in Madera County and 4,000 acres in Fresno County, of which approximately 1,600 acres are now in public ownership.

In February 1998, two large cylindrical fish screens were installed at one of the largest Delta diversions located on Sherman Island.



Lower Colorado River System. In 1995, DOI executed partnership agreements with California, Nevada, and Arizona to develop a multi-species conservation program for ESA-listed species and many non-listed, but sensitive, species within the 100-year floodplain of the lower Colorado River, from Glen Canyon Dam downstream to the Mexican border. In 1996, a joint participation agreement was executed to provide funding for the program. USFWS has designated the Lower Colorado River Multi-Species Conservation Program steering committee as an ecosystem conservation and recovery implementation team pursuant to ESA. The steering committee is composed of representatives from the three states, DOI, Indian tribes, water agencies, power agencies, environmental organizations, and others.

The conservation program will work toward recovery of listed and sensitive species while providing for current and future use of Colorado River water and power resources, and includes USBR's Colorado River operations and maintenance actions for the lower river. Over 100 species will be considered in the program, including the southwestern willow flycatcher, Yuma clapper rail, and four fish species listed under the federal ESA: Colorado squawfish, razorback sucker, humpback chub, and bonytail chub. Developing the program is estimated to take three years. Costs of program development and implementation of selected interim conservation measures, estimated at \$4.5 million, are to be split equally between DOI and the non-federal partners.

USBR initiated a formal Section 7 consultation process with USFWS, who issued a five-year biological opinion on USBR operation and maintenance activities from Lake Mead to the southerly international boundary with Mexico in 1997. USBR has estimated that the cost of implementing the biological opinion's reasonable and prudent alternatives and measures could be as high as \$26 million.

The steering committee is currently participating in funding several interim conservation measures. These include a razorback sucker recovery program at Lake Mojave, restoration of Deer Island near Parker, Arizona, and a "Bring Back the Natives" program sponsored by the National Fish and Wildlife Foundation.

Other Watersheds. Major environmental restoration activities are ongoing in other watersheds throughout the State, including the Russian and Kings Rivers and Lake Tahoe.

A Russian River Action Plan, prepared by Sonoma

County Water Agency in 1997, provides a regional assessment of needs in the Russian River watershed and identifies fishery habitat restoration projects in need of funding. The SWRCB is promoting a coordinated Russian River fishery restoration plan.

Kings River Conservation District and the Kings River Water Association are cooperating with USACE in a feasibility study of Kings River fishery habitat improvements. One component of the study includes a new multi-level intake structure for the reservoir, to better manage downstream river temperatures. USACE is also implementing a related project to install a bypass pipe at the dam's powerplant so that releases can be made through the existing penstocks when the turbines are not in operation. This project will provide temperature control for the downstream trout fishery.

The Tahoe Regional Planning Agency, a bi-state agency created by Congress, has identified nearly \$500 million in capital improvements needed to achieve environmental targets in the Lake Tahoe watershed. Federal, state, and local governments have invested nearly \$90 million in erosion control, storm water drainage, stream zone restoration, public transit, and other capital projects. The U.S. Forest Service has implemented a watershed restoration program and a land acquisition program to prevent development of sensitive private lands. The State of Nevada approved a \$20 million bond measure to perform erosion control and other measures on the east side of the lake. In California, Proposition 204 provides \$10 million in bond funds for land acquisition and programs to control soil erosion, restore watersheds, and preserve environmentally sensitive lands.

Mitigation Projects. Significant habitat improvements are also resulting from land management or mitigation projects being carried out by water agencies. For example, the Department purchased much of Sherman and Twitchell Islands in the Delta, and is implementing management plans on them to control subsidence and soil erosion, while providing significant wetland and riparian habitat for wildlife. The plans also provide recreational opportunities such as walking trails and wildlife viewing.

CCWD established over 18,000 acres of preserve as part of its Los Vaqueros construction project. This land is being managed to protect listed species such as the San Joaquin kit fox. The project impacted 174 acres of valley oaks and 9 acres of alkali wetlands. To mitigate, CCWD is creating or enhancing 394 acres of woodland habitat and 49 acres of wetlands.

Kern Water Bank Authority set aside about 10,000 acres for habitat purposes as part of its 20,000-acre Kern Fan Element project. ESA listed species found in the project area include the kit fox, kangaroo rat, and blunt-nosed leopard lizard.

As part of its Eastside Reservoir project, MWDSC purchased 3,700 acres for the Nature Conservancy's Santa Rosa Plateau Ecological Reserve. MWDSC also purchased 9,000 acres for the Southwestern Riverside County Multi-Species Reserve, including lands around the reservoir, Lake Skinner, and the 2,500-acre Dr. Roy E. Shipley Reserve.

Behind Prado Dam in Riverside County, Orange County Water District operates 465 acres of constructed freshwater wetlands to reduce the nitrogen levels in the Santa Ana River. The river provides much of the county's coastal plain groundwater recharge. The Prado wetlands are home to several rare and endangered bird and waterfowl species. More than 226 acres are set aside as habitat for the endangered least Bell's vireo and southwestern willow flycatcher.

Implementation of Urban Water Conservation MOU

The 1991 *Memorandum of Understanding Regarding Urban Water Conservation in California* defined a set of urban best management practices and procedures for their implementation, and established a California Urban Water Conservation Council composed of MOU signatories (local water agencies, environmental groups, and other interested parties). More than 200 entities have signed the MOU. The CUWCC has monitored implementation of BMPs and reported progress annually to the SWRCB. The Council developed a plan providing for ongoing review of BMPs and potential BMPs. In late 1996, the Council initiated a review of the BMPs to clarify expectations for implementation and to develop an implementation evaluation methodology. Revised BMPs were adopted in 1997.

Implementation of Agricultural Efficient Water Management Practices MOU

The Agricultural Efficient Water Management Practices Act of 1990 (AB 3616) required the Department to establish an advisory committee to develop EWMPs for agricultural water use. Negotiations among agricultural water users, environmental interests, and governmental agencies on a memorandum of understanding to implement EWMPs were completed in

1996. The MOU established an Agricultural Water Management Council to oversee EWMP implementation, much like the organizational structure that exists for urban BMPs, and also provided a mechanism for its signatories to evaluate and endorse water management plans. By May 1998, the MOU had been signed by 31 agricultural water suppliers irrigating about 3 million acres of land, as well as by over 60 other entities.

Klamath River Fishery Issues

The primary water management issue in the interstate Klamath River basin is the restoration of fish populations that include listed species such as the Lost River and shortnose suckers, coho salmon, and steelhead trout. The Lost River sucker is native to Upper Klamath Lake and its tributaries, and the shortnose sucker is found in the Lost River, Clear Lake, Tule Lake, and Upper Klamath Lake. Both species spawn during the spring. Higher water levels in Upper Klamath Lake have been identified as an aid to recovery of these fisheries. Coho and steelhead were recently listed, and water supply implications will not be known until management plans are completed and recovery goals are established.

To address the need for greater certainty in project operations, USBR began preparing a long-term Klamath Project Operations Plan in 1995. Several issues have delayed completion of the long-term plan. USBR has issued an annual operations plan each year since 1995. The Klamath River Compact Commission is facilitating discussions on water management alternatives to address water supply needs. This three-member commission was established by an interstate compact ratified by Congress in 1957 to facilitate integrated management of interstate water resources. The KRCC, USBR, and both states are cooperatively developing water supply options. Members include a representative from the Department, the Director of the Oregon Water Resources Department, and a presidentially-appointed federal representative.

Truckee-Carson River System

The Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Title II of Public Law No. 101-618) settled several water rights disputes affecting the waters of Lake Tahoe, the Truckee River, and the Carson River. Of most importance to California, the act made an interstate apportionment of these waters between the States of California and Nevada. (It was the first

congressional apportionment since the Boulder Canyon Project Act of 1928.) The act addresses several other issues, including settlement of water supply disputes between the Pyramid Lake Paiute Tribe of Indians and other users of the Truckee and Carson Rivers. The act also addresses environmental concerns, such as recovery of listed fish species in Pyramid Lake.

Many of the act's provisions—including the interstate apportionment between California and Nevada—will not take effect until several conditions have been satisfied, including dismissal of specified lawsuits and negotiation and adoption of a Truckee River Operating Agreement. The act requires that a TROA be negotiated among DOI and California and Nevada, after consultation with other parties as may be designated by DOI or by the two states. The TROA addresses interstate water allocation and implements an agreement between Sierra Pacific Power Company and the United States which provides for storing water in upstream reservoirs for Pyramid Lake fish and emergency drought water supplies for the Reno-Sparks area. TROA negotiation has been ongoing since 1991. A draft TROA is analyzed in an EIS/EIR prepared by DOI. (The Department is the State lead agency for compliance with the requirements of CEQA.) The draft EIS/EIR was released for public review in 1998 and is expected to be completed in 1999.

City of Los Angeles' Water Supply from Owens Valley

In 1913, the City of Los Angeles began diverting water from Owens Valley through the Los Angeles Aqueduct. A second aqueduct, completed in 1970, increased the Los Angeles Department of Water and Power's capacity to divert both surface and groundwater from the Owens Valley. LADWP's water diversions have resulted in degradation of the valley's environmental resources. Recent issues have revolved around rewatering the lower Owens River and dust control on the Owens Lakebed.

Rewatering Lower Owens River. In 1972, Inyo County initially filed suit against the city, claiming that increased groundwater pumping from the second aqueduct was harming the Owens Valley environment. An EIR was subsequently prepared jointly by LADWP and the county, and in 1991 both parties executed a long-term water management agreement delineating how groundwater pumping and surface water diversions would be managed to avoid significant decreases in vegetation, water-dependent recreational uses, and

wildlife habitat. Several agencies, organizations, and individuals challenged the adequacy of the EIR and were granted *amici curiae* status by the Court of Appeals, allowing them to enter in the EIR review process. Another agreement was subsequently executed in 1997, ending 25 years of litigation between Los Angeles and Inyo County.

The lower Owens River project, a major provision of the agreement, was developed to rewater approximately 60 miles of the Owens River channel from the LAA diversion downstream to Owens Lake. The project is also identified in the EIR as compensatory mitigation for impacts that occurred between 1970 and 1990 that were considered difficult to quantify or mitigate directly. Four significant physical features of the LORP and agreement are: provision of year-round flows in the lower Owens River (with a pumpback station just above the Owens River delta to return some of the water to the LAA), provision of flows past the pumpback station to create new wetlands in the Owens Lake delta, enhancement of off-river lakes and ponds, and development of a new 1,500-acre waterfowl habitat area.

The majority of planning work is expected to be completed by December 1998. Los Angeles will pay the costs of implementing the project, with the county repaying one half of the costs up to a maximum of \$3.75 million. To date, the federal government has committed \$300,000 for the design of the pumpback system. Congress has approved another \$250,000 for planning and development work. LADWP and the county will jointly prepare an EIR on the LORP, with a draft expected by June 2000. Rewatering of the river channel will begin within 6 years after the pumpback system is completed.

Dust Control on Owens Lakebed. Owens Lake became a dry lakebed by 1929. On windy days, airborne particulates from the dry lakebed violate air quality standards in the southern Owens Valley. In 1997, the Great Basin Unified Air Pollution Control District ordered the City of Los Angeles to implement control measures at Owens Lake to mitigate the dust problems. Under the order, 8,400 acres of lakebed would be permanently flooded with a few inches of water, another 8,700 acres would be planted with grass and irrigated, and 5,300 acres would be covered with a 4 inch layer of gravel. This order, which was appealed by the city, could reduce the city's potential diversion by 50 taf/yr or about 15 percent of its supply.

In July 1998, a compromise was reached when

LADWP agreed to begin work at Owens Lake by 2001 and to ensure that federal clean air standards would be met by 2006. In turn, the APCD agreed to scale back the improvements sought in its 1997 order. Under this compromise, LADWP's dust-control strategy may include shallow flooding, vegetation planting, and gravel placement. The implementation schedule requires that 6,400 acres of lakebed be treated by the end of 2001. By the end of 2006, an additional 8,000 acres would be treated, plus any additional lakebed necessary to bring particulate counts into compliance with federal air quality standards. The plan hinges on final approval from the Los Angeles City Council, the APCD's board, and the State Air Resources Board.

Mono Basin

Mono Lake and its tributaries have been the subject of extensive litigation between the City of Los Angeles and environmental groups since the late 1970s. In 1983, the California Supreme Court ruled that SWRCB has authority to reexamine past water allocation decisions and the responsibility to protect public trust resources where feasible. SWRCB issued a final decision on Mono Lake (Decision 1631) in 1994. Amendments to LADWP's water right licenses are set forth in the order accompanying the decision.

The order sets instream flow requirements for fish in each of the four streams from which LADWP diverts water. The order also establishes water diversion criteria to protect wildlife and other environmental resources in the Mono Basin. These water diversion criteria prohibit export of water from Mono Basin until the lake level reaches 6,377 feet, and restrict Mono Basin water exports to allow the lake level to rise to an elevation of 6,391 feet in about 20 years. Once the water level of 6,391 feet is reached, it is expected that LADWP will be able to export about 31 taf of water per year from the basin. The order requires LADWP to prepare restoration plans for the four streams from which it diverts and to restore part of the waterfowl habitat which was lost due to lake level decline. In May 1997, parties to the restoration planning process presented a signed settlement on Mono Basin restoration to the SWRCB. If approved, the settlement would guide restoration activities and annual monitoring through 2014.

Key features of the stream restoration plans include restoring peak flows to Rush, Lee Vining, Walker, and Parker Creeks; reopening abandoned channels in Rush Creek; and developing a monitoring plan. One

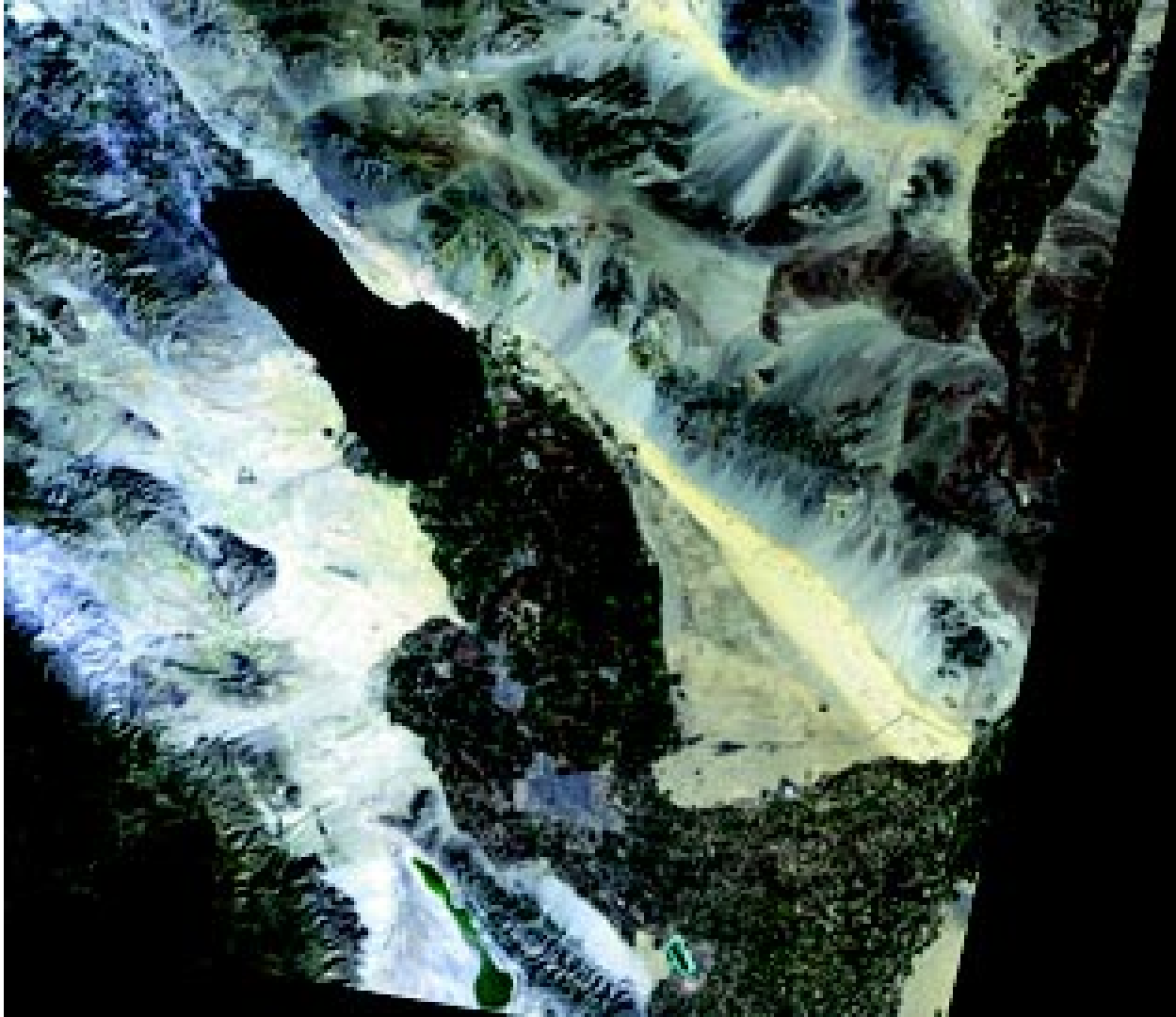
of the restoration actions required by SWRCB—bypassing sediment around LADWP diversion dams—was deferred for further analysis. The waterfowl habitat restoration plan proposes that a Mono Basin waterfowl habitat restoration foundation administer a \$3.6 million trust established by LADWP. Five of the parties to the agreement would serve as initial members of the foundation. Activities would include annual monitoring, restoring open water habitat adjacent to the lake, and rewatering Mill Creek. LADWP would continue its brine shrimp productivity studies, open several channels on Rush Creek, and make its Mill Creek water rights available for rewatering Mill Creek, based on the recommendations of the foundation. The plans are being considered by SWRCB and a decision is expected at the end of 1998.

Salton Sea

The present day Salton Sea was formed in 1905, when Colorado River water flowed through a break in a canal that had been constructed along the U.S./Mexican border to divert the river's flow to agricultural lands in the Imperial Valley. Over the long term, the sea's elevation has gradually increased, going from a low on the order of -250 feet in the 1920s to its present level of about -226 feet. The Salton Sea is the largest lake located entirely within California, with a volume of about 7.5 maf at its present elevation of -226 feet. The sea occupies a closed drainage basin—if there were no inflows to maintain lake levels, its waters would evaporate. The sea receives over 1 maf annually of inflow, primarily from agricultural drainage. The largest sources of inflow (about 80 percent of the total) are the New and Alamo Rivers, which drain agricultural lands in the Mexicali and Imperial Valleys and flow into the sea's southern end.

The sea supports water-based recreational activities and has had a popular corvina fishery. During the 1950s, the highest per capita sport fishing catches in California were from the Salton Sea. Over the years, concerns about the sea's salinity have been voiced in the context of maintaining the recreational fishery that was established with introduced species able to tolerate high salinities.

The sea also provides important wintering habitat for many species of migratory waterfowl and shorebirds, including some species whose diets are based exclusively on the fish in the sea. Wetlands near the sea and adjoining cultivated agricultural lands offer the avian population a mix of habitat types and food sources.



A natural-color infrared satellite image of the Salton Sea (January 1998 Landsat 5). The irrigated areas in Imperial Valley are clearly visible to the south of the sea, as are the Algodones Dunes to the southeast. The City of Mexicali and irrigated acreage in the Mexicali Valley can also be seen.

es. An area at the sea's south end was established as a national wildlife refuge in 1930, although most of that area is now under water as a result of the sea's rising elevation. Some of the 380 bird species wintering in the area include pelicans, herons, egrets, cranes, cormorants, ibises, ducks, grebes, falcons, plovers, avocets, sandpipers, and gulls. The Salton Sea is considered to be a major stopover point for birds migrating on the Pacific flyway, and has one of the highest levels of bird diversity of refuges in the federal system.

Historically, salinity has been the water quality constituent of most concern at the sea. Present levels are about 44,000 mg/L TDS (seawater is about 35,000 mg/L TDS). This high level of salinity reflects long-term evaporation and concentration of salts found in

its inflow. Selenium has been a more recent constituent of interest, due to its implications for aquatic species. Although selenium levels in the water column in the sea are less than the federal criterion of 5 $\mu\text{g/l}$, this concentration can be exceeded in seabed sediment and in influent agricultural drainage water. Agricultural drain flows also contribute significant nutrient loading to the sea, which supports large algal blooms at some times of the year.

Over the years, USBR and others have considered potential solutions to stabilize the sea's salinity and elevation. Most recently, the Salton Sea Authority (a joint powers authority consisting of Riverside and Imperial Counties, Imperial Irrigation District, and Coachella Valley Water District) and others have been perform-

ing appraisal level evaluations of some of the frequently suggested alternatives. Maintaining a viable Salton Sea has several water management implications. First will be the actions needed to stabilize the sea's salinity in the near-term, such as the authority's diking proposal. Eventually, a long-term solution will need to be developed. A wide range of costs has been mentioned for a long-term solution, including amounts in the billion-dollar range. Some of the possible long-term solutions suggested would entail constructing facilities in Mexico, bringing a greater level of complexity to their implementation.

Other water management programs in the region, such as proposals to transfer conserved agricultural water supplies, will have to be evaluated in terms of their impacts on the sea. Recent proposals to desalt water in the Alamo or New Rivers and to transport that water in the Colorado River Aqueduct to the South Coast for urban water supply have raised concerns about maintaining the sea's environmental productivity. Such proposals might be implemented as part of the second phase of CRB's draft 4.4 Plan.



Roadrunners are one of the bird species found year-round in the Salton Sea area.

Congressional legislation introduced in 1998 would authorize expenditure of federal funds for a multi-year study of the sea's resources and potential solutions for managing its salinity.